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| 09/386,247      | 08/31/1999  | KEVIN J. TOREK       | MICRON.06A/9        | 1200             |

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EXAMINER

TRAN, BINH X

|          |              |
|----------|--------------|
| ART UNIT | PAPER NUMBER |
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1765

DATE MAILED: 03/13/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/386,247

Applicant(s)

TOREK ET AL.

Examiner

Binh X Tran

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 08 June 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 6,9,15-20,22-24,26-29,31-33,35,63,64,66-68,70-76 and 79 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 6,9,15-20,22-24,26-29,31-33,35,63,64,66-68,70-76 and 79 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

### **DETAILED ACTION**

1. The examiner decides to withdraw to final action in previous office action mailed on 12-18-2002. The applicants only need to respond to this new office action below with the statutory period for reply is set to expire 3 months from the mailing date of this office action.

#### ***Information Disclosure Statement***

2. The information disclosure statement (IDS) submitted on 11-15-2002 is acceptable. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner. In previous office action, the examiner indicated that Patent and Trademark Office (PTO) charged the applicants a fee for the IDS submitted on 11-15-2002. However, since the certification under 37 CFR 1.97 is valid, no fee is required. According, the PTO refunds the fee that PTO charged the applicants in previous office action.

#### ***Election/Restrictions***

3. Applicant's election without traverse of Species 1b, 2a, and in Paper No. 12 is acknowledged.

#### ***Claim Rejections - 35 USC § 112***

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

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5. Claim 63 is rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

In claim 63, the examiner cannot find the support for the limitation “wherein the thickness of the boundary layer increases an amount of ozone that is transferred to the workpiece” (emphasis added).

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claim 63 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 63, the examiner does not understand the limitation “wherein the thickness of the boundary layer increases an amount of ozone that is transferred to the workpiece”. The examiner interprets every layer must have a certain thickness value. The thickness values itself cannot result in an increase an amount of ozone that is transferred to the workpiece. A decrease or increase in thickness value may result in an increase in the amount of ozone. The examiner recognizes that there may be a relationship (such inverse proportional or proportional) between the thickness value and amount of ozone. However, it is impossible for the thickness of the boundary layer increases an amount of ozone. Since the examiner does not understand this limitation

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at all, for the purpose of examination, the examiner will assume that this limitation does not exist.

***Claim Rejections - 35 USC § 103***

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 6-9, 16, 79 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bergman et al. (US 6,273,108) in view of Dautartas et al. (US 6,124,158).

Bergman discloses an apparatus comprising:

an ozone source (75) configured to supply ozone to process chamber (15);

a nozzle (40) (read on "sprayer") connected to a fluid source such that fluid sprays over a workpiece (20) in the process chamber (col. 4 lines 20-25);

a pump (55) connected to the fluid source (i.e. reservoir 45).

Bergman does not disclose a selector valve connected to the pump to selectively pulse the fluid through the sprayer (i.e. the nozzle 40). In a semiconductor apparatus, Dautartas discloses that pulsed valves to selectively pulse the fluid through the sprayer (col. 4 lines 24-27, col. 5 lines 14-20)

It would have been obvious to one having ordinary skill in the art, at the time of invention, to Bergman in view of Dautartas, by using a valve to pulse the fluid through the sprayer because this will allow more flow control, increased efficiency and reliability.

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Further Bergman is not particular whether the fluid is flown continuously or intermittent (i.e., continuous vs. pulse) therefore pulsing would produce an expected result.

Respect to claim 7, Bergman discloses the workpiece is an semiconductor wafer (20) (See col. 4 lines 3-7). Respect to claims 8-9, Bergman discloses the apparatus comprise a support or cassette (25) that holds a plurality of semiconductor wafer (20) wherein the cassette can be rotated using the rotor assembly 30 (See col. 4 lines 12-20).

Respect to claim 16, Bergman discloses the RPM is a result effective variable. The result effective variable is commonly determined by routine experiment. The process of conducting routine experiments so as to produce an expected result is obvious to one of ordinary skill in the art. Hence, it would have been obvious to one of ordinary skill in the art, at the time the invention to modify Bergman by perform routine experiments to obtain optimal result. Respect to claim 16, 79, Dautartas discloses the substrate is not rotate (read on "stationary velocity" or "not exceeding 100 RPM")

10. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bergman et al. (US 6,273,108) in view of Kasting, Jr. et al. (US 5,598,316).

Bergman discloses a reaction chamber comprising:

a gas input (from the ozone generator 75);

a plurality of nozzles (40);

a wafer cartridge holding wafer (25)

a first fluid flow line (70) connect to the nozzle (40)

a second water (105) capable divert water flow away from the chamber which connect to the fluid flow line (70).

Bergman does not disclose that the nozzles connected to a nozzle manifold. In an ozonated apparatus, Kasting disclose a manifold to supply ozonated water to the chamber (See col. 6 lines 48-56).

It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Bergman in view of Kasting by utilizing the manifold connect to a plurality of nozzle because it would allow the flow to be more distributed.

11. Claims 17-20, 27-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bergman (US 6,273,108) in view of Boley (US 6,132,629).

Respect to dependent claims 17, 27 Bergman teaches at least one processing chamber wherein ozone rich environment exists within the object processing chamber; and a sprayer, a pump connected to the chamber. Bergman does not teach pulsing fluid source, the fluid source configured to pulse a solution through the sprayer into the ozone rich environment.

Boley discloses that ozonated water can be supplied in both continuous and/or intermittent mode (Note: intermittent is the same with "pulsing", See col. 10 lines 1-10, col. 14 lines 15-19).

It would have been obvious to one having ordinary skill in the art, at the time of invention, to Bergman in view of Boley, by pulsating the ozone-rich solution because this will allow more flow control, increased efficiency and reliability. Further Bergman is

not particular whether the fluid is flown continuously or intermittent (i.e., continuous vs. pulse) therefore pulsing would produce an expected result.

Respect to claims 18-19, 28, Bergman discloses the solution is ozonated (i.e., ozone rich) and the solution combines with ozone (from ozone generator) in the ozone rich environment or in the processing chamber (15). Respect to claim 20, Bergman discloses a plurality of spray nozzles 40 (See Fig 1). Bergman further discloses a plurality of spray nozzles that sprays the fluid into the semiconductor process chamber (15) (claim 29).

12. Claims 22-24, 26, 31-33, 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bergman in view of Boley, and further in view of Dautartas.

The dependent claims 22-23, 31-32 differ from the Bergman and Boley by the specific number pulse per unit of time. Dautartas disclose the ozone pulsing from 1 to 10 second (col. 6 lines 5-15, read on "one pulse very two second"). This parameter is commonly determined by routine experiment. The process of conducting routine optimization experiments so as to produce an expected result is obvious to one of ordinary skill in the art. Hence, it would have been obvious to one of ordinary skill in the art, at the time the invention, to perform routine experiments to obtain optimal result. Further the selection of particular values for these parameters is simply a design choice base on routine experiments.

Since duty cycle is defined as the function of the amount of time the fluid flow and the amount of time the fluid does not flow, any person in the art would be able to



calculate the duty cycle base on the amount of time that the fluid flows and the amount of time the fluid substantially does not flow.

Respect to claims 24, 26, 33, 35 the examiner already discussed that the duty cycle can be calculated base on the on the amount of time that the fluid flows and the amount of time the fluid substantially does not flow. Since Dautartas teaches the amount of time of the flow or no flow is a result effective variable, the examiner will interprets that the duty cycle is a result effective variable. The result effective variable is commonly determined by routine experiment. The process of conducting routine experiments so as to produce an expected result is obvious to one of ordinary skill in the art. Hence, it would have been obvious to one having ordinary skill in the art, at the time of invention, to perform routine experiment to obtain optimal duty cycle as an expected result. Further, the duty cycle must be greater than zero and less than 100.

13. Claims 63-64, 66-68, 70-76 rejected under 35 U.S.C. 103(a) as being unpatentable over Dautartas (US 6,124,158) in view of Bergman (US 6,273,108).

Dautartas discloses:

a fluid source (ozone and/or water) capable of generating a pulse flow (read on "capable of varying a fluid from a greater flow to a lesser flow", col. 5-6);

pulsed valves (col. 4 lines 22-26read on "one or more nozzles") capable of spraying the varying fluid over the workpiece;

a substrate support in the chamber capable of rotating the wafer at stationary speed (read on "a platform capable of rotating the workpiece at one or more speeds");

Dautartas does not explicitly use the duty cycle. However Dautartas clearly discloses that the pulse is between 1 to 10 second. Any person in the art would be able to figure it out the amount of time that the fluid flows and the amount of time that the fluid substantially does not flow. Since duty cycle is defined as the function of the amount of time the fluid flow and the amount of time the fluid does not flow, any person in the art would be able to calculate the duty cycle base on the amount of time that the fluid flows and the amount of time the fluid substantially does not flow.

Dautartas does not disclose that the one or more speed in used to control the thickness of a boundary layer. Bergman discloses a platform capable of rotating the wafer at one or more speed to control the thickness of boundary layer (Fig 3, col. 6). It would have been obvious to one having ordinary skill in the art, at the time of invention to modify Dautartas in view of Bergman by using the rotating platform to control the boundary thickness because this will enhance the amount of photoresist stripping rate.

Respect to claim 64, Dautartas disclose a substantially no flow thereby creating a pulse of fluid (col. 5-6). Respect to claim 66-67, Dautartas disclose the pulse at 1 to 10 seconds (col. 6 7-8, read on "varying fluid varies from lesser flow to greater flow at approximately one time every two second ...").

Respect to claims 68, 70-71 the examiner already discussed that the duty cycle can be calculated base on the on the amount of time that the fluid flows and the amount of time the fluid substantially does not flow. Since Dautartas teaches the amount of time of the flow or no flow (i.e., time of the pulse) a result effective variable, the examiner will interprets that the duty cycle is a result effective variable. The result

effective variable is commonly determined by routine experiment. The process of conducting routine experiments so as to produce an expected result is obvious to one of ordinary skill in the art. Hence, it would have been obvious to one having ordinary skill in the art, at the time of invention, to perform routine experiment to obtain optimal duty cycle as an expected result. Further, the duty cycle must be greater than zero and less than 100.

Respect to claim 72-74, Dautartas discloses the substrate support does not rotate therefore it must have a stationary speed. Respect to claims 75-76, 79, Bergman discloses that the temperature is the result effective variable. The result effective variable is commonly determined by routine experiment. The process of conducting routine experiments so as to produce an expected result is obvious to one of ordinary skill in the art. Hence it would have been obvious to one having ordinary skill in the art, at the time of invention to perform routine experiment to obtain optimal temperature as an expected result.

### ***Response to Arguments***

14. Applicant's arguments with respect to claims 6-9, 16, 22-24, 26, 31-33, 35, 6364, 66-68, 70-76 have been considered but are moot in view of the new ground(s) of rejection.

15. Applicant's arguments filed 8-6-2002 with respect to claims (17-20, 27-29) have been fully considered but they are not persuasive. The applicants argue that Bergman require continuous spray and high RPM; Boley employed intermitted use to provided only a small amounts of ozone. According to applicants a person attempting to increase

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the amount of ozone would not look to the teaching of Boley. According to applicants Bergman teaches away from the Boley patent. The examiner disagrees. Since Boley clearly teaches the advantage of applying intermit spray, any person would applying it because it would allow more flow control, increased efficiency. The arguments regarding the Boley reference teaches "small amount of ozone" is not commensurate with the scope of the claim since there is no limitation which disclose a specific flow rate of ozone. The argument that Bergman requires high rotation velocities whether the applicant invention requires low is not persuasive. The examiner only needs to prove that the rotator is capable of rotate at low velocity. The examiner does not need to prove that it must rotate at a low rotation velocity all the time. Since the rotator rotates at high velocity, it is certainly capable of rotating at low velocity. Further, the velocity must to go from zero (stationary) to a maximum velocity. At some point between zero and maximum velocity, it must pass through the low rotating velocity. The examiner therefore maintains the 103 rejections in previous office action with respect to the above claims.

### ***Conclusion***

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Binh X Tran whose telephone number is (703) 308-1867. The examiner can normally be reached on Monday-Thursday and every other Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin L Utech can be reached on (703) 308-3836. The fax phone

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numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Binh X. Tran  
March 4, 2003

  
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